

CLAIMS

What is claimed is:

1. An organic photosensitive optoelectronic device comprising:
an anode;
5 multiple subcells in series, each subcell comprising:
an electron donor layer, and
an electron acceptor layer in contact with the electron donor layer,
an electron-hole recombination zone separating the subcells, and
a cathode,
10 wherein the current generated by each subcell is about equal.
2. The device of claim 1, wherein an exciton blocking layer is situated between the electron acceptor layer and the cathode.
- 15 3. The device of claim 2, wherein the exciton blocking layer comprises BCP.
4. The device of claim 2, wherein the exciton blocking layer comprises Alq₃OPH.
5. The device of claim 1, wherein the an anode smoothing layer is situated between the
20 electron donor layer and the anode.
6. The device of claim 1, wherein the an anode smoothing layer comprises PEDOT:PSS.
7. The device of claim 1, wherein the electron donor layer comprises a phthalocyanine or
25 a porphyrin, and the electron acceptor layer comprises a perylene, naphthalene,
fullerene or nanotubule.
8. The device of claim 1, wherein the anode is selected from transparent conducting
oxides.
- 30 9. The device of claim 8, wherein the anode is selected from ITO.

10. The device of claim 1, wherein the electron-hole recombination zone is a semitransparent metal layer.

11. The device of claim 1, wherein the electron-hole recombination zone is selected from a layer of Ag, Li, LiF, Al, Ti, and Sn.

12. The device of claim 11, wherein the electron-hole recombination zone is a layer of Ag.

13. The device of claim 1, wherein the electron-hole recombination zone is less than about 20 Å

14. The device of claim 10, wherein the metal layer is composed of nanoparticles.

15. The device of claim 1, wherein the electron-hole recombination zone comprises a region of electronically active defects.

16. The device of claim 2, wherein:

the electron transport layer is PTCBI

the hole transport layer is CuPc;

the electron-hole recombination zone is Ag, and

the exciton blocking layer is BCP.

17. The device of claim 1, wherein the external power conversion efficiency is at least 1% at one sun illumination.